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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

EV 3959873338 US

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☐ *Additional inventors are being named on the _____ separately numbered sheets attached hereto*

TITLE OF THE INVENTION (500 characters max)

METHOD AND APPARATUS FOR SETTING VCXO IN VIDEO PLAYBACK DEVICE

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 4 ☐ CD(s), Number _____

☒ Drawing(s) *Number of Sheets* 2 ☐ Other (specify) _____

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check or money order is enclosed to cover the filing fees

FILING FEE AMOUNT ($): 160

☒ The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 07-0832

☐ Payment by credit card. Form PTO-2038 is attached.

The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

☐ No.

☐ Yes, the name of the U.S. Government agency and the Government contract number are: _____.

Respectfully submitted,

SIGNATURE _____ Date 2/26/04

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USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

METHOD AND APPARATUS FOR SETTING VCXO IN VIDEO PLAYBACK DEVICE

The subject invention concerns a method and apparatus for setting a frequency reference in an integrated receiver decoder (IRD). More specifically, the present application discloses an electrical circuit arrangement in which the voltage controlled crystal oscillator (VCXO) is set to oscillate at a desired frequency prior to the initial use thereof. Preferably, the VCXO is set so that the IRD is able to generate the colorburst signal from the in-coming data signal to thereby correctly generate a color sub-carrier for the incoming data signal. The IRD has a non-volatile memory unit for storing the frequency at which the VXCO operates. Upon receiving the data signal, the IRD uses a threshold value to compare the frequency of the incoming data signal with the frequency stored in the non-volatile memory. If the frequencies differ by a predetermined value, the frequency from the incoming data signal is stored in the non-volatile memory and is used to set the VCXO. An alternate method would be to save the locked frequency value in non-volatile memory when power is removed. This saved value would be used the next time the IRD is powered up.

The subject invention may be implemented in a set-top cable box or video decoder that is capable of receiving a satellite signal or a cable television signal. Such a system usually receives encoded packets of data representing video and audio information in a compressed form. Part of the packetized incoming data signal is the video signal which is encoded so that a color signal can be generated and viewed upon being decoding at the proper frequency. Thus, it is important for the VCXO to be configured to oscillate at the proper frequency.

Prior devices have only been able to ensure proper oscillation frequency by using the time stamps associated with the incoming video data. This method of obtaining the frequency is inadequate as the IRD is still likely to display a monochromatic or partial color signal upon initial use. This occurs because the VCXO could be off frequency enough from the colorburst in order to generate the color sub-carrier thereby causing the display device, i.e. a television, to be unable to extract the color signal. This method of setting the oscillation frequency also causes a delay in processing the incoming signal.

By implementing the present invention, a user is assured that each time the video signal is viewed on the display device, it is viewed in color. In order for the IRD

to accomplish this, the VCXO maintains a frequency of 27MHz. In order for the IRD to generate the color sub-carrier, the frequency must be divided down to 3.579545 MHz. It is thus an object of the present invention to pre-store a bit rate multiplier number (BRM) in a non-volatile memory unit which is used to apply a specific voltage to the VCXO so that the VCXO oscillates within a certain range of the acceptable frequencies. The VCXO must track the timestamps of the data signal and must not differ by more than a few parts per million (ppm). Preferably, the signal should not differ by more than 15ppm. If the IRD detects that the timestamp of the incoming data signal is greater than a few ppm from the 3.579545 MHz, then the IRD is able to store a new BRM obtained from the data signal in the non-volatile memory which will be used to ensure that the VCXO is set to oscillate at the required frequency to generate the color subcarrier and thereby allow the color signal to be viewed on a display device such as a television.

Another advantage of the present invention is to provide a method of applying the necessary voltage to the VCXO whereby the physical attributes of the crystal are irrelevant. Physical attributes that affect the voltage which needs to be applied to a crystal include but are not limited to temperature, cut frequency, and age of the crystal. Any of the above physical attributes could at any time cause a different BRM to be applied thereto in order to have the VCXO oscillate at the proper frequency. Thus, any discrepancy could prevent the television from locking onto the colorburst signal thereby causing the video signal to be displayed in monochrome, including only partial color and/or containing color flutters. The method of the present invention ensures that a proper BRM is applied at all times to the VCXO thus ensuring oscillation at the desired frequency.

The method of the present invention may also be included in a PVR (personal video recorder) wherein the video signals are recorded and stored for replay at a later time.

The present invention includes a method and apparatus for factory setting a VCXO to the midpoint of its available range. A data signal, preferably a satellite signal including timestamps, is applied to an IRD which recovers the clock signal therefrom. The IRD determines whether the pre-stored VCXO value is within a range not greater than a few ppm of the new VCXO value obtained from the data signal. If the incoming data signal varies greater than a few ppm from the stored value, the new value is stored and is used. This process repeats each time a new signal is

applied and/or the IRD is shutdown or rebooted. Therefore, the value for setting the VCXO will always be stored in memory as a default so as ensure that the colorburst of the incoming signal can be locked and that a color subcarrier will be properly generated to allow the television to display the color signal.

Figure 1 is a block diagram of the apparatus for setting the VCXO in a video playback device. The apparatus is preferably an IRD that includes a processor connected to a non-volatile memory unit and a VCXO. The non-volatile memory unit has a bit rate multiplier number (BRM) stored therein. The BRM is pre-stored when the IRD is manufactured. This BRM, when provided by the processor to the VCXO causes the VCXO to generate a pre-determined clock signal within a useable frequency range for generating the colorburst signal. The pre-stored BRM causes the VCXO to oscillate at a frequency of 27.000000 MHz. The frequency generated by the VCXO is used to generate a colorburst for an outgoing video signal.

The IRD further includes a tuner for receiving an incoming RF signal, preferably a satellite or cable signal. A demodulator/link is connected to the tuner which demodulates the incoming signal and a transporter transports the demodulated signal along a bus to a decoder. The VCXO is also connected to the decoder and provides a clock signal thereto. The decoder de-encodes the received data signal into its respective parts. It is important for the clock signal provided by the VCXO to the de-encoder to be within a range of a few ppm of the clock signal contained in the incoming signal in order to allow the de-encoder to successfully de-encode the data signal The DENC (Digital encoder) takes the digital data and converts it to an analog form and generates the color subcarrier burst at a frequency of 3.579545 MHz. This frequency allows the viewing device, preferably the television, to display the incoming data signal in color as intended when the signal was originally broadcast.

Referring to Figure 2, the method by which the IRD generates the color subcarrier will be discussed. Initially, the IRD is plugged into an external power source and incoming data line is connected thereto. The processor loads the pre-stored BRM value from the non-volatile memory and applies the BRM to the VCXO to generate an initial clock signal which is in turn provided to both the processor and the de-encoder. The tuner of the IRD then tunes the incoming data signal which is demodulated and transported along the bus to the de-encoder. The incoming data signal has a satellite clock signal associated therewith. The processor looks at the time stamps and sets the BRM value to match the time stamps. The processor then

determines if the initial clock signal matches the satellite/cable clock signal. If the initial clock signal is within a range of a few ppm of the satellite/cable signal, then the de-encoder is able to de-encode the incoming data signal and generate the color subcarrier so that the television is able to display the video signal in color. If however, the clock signals differ by greater than plus or minus a few ppm, a new BRM value is stored in the non-volatile memory unit. Also, the IRD includes an early power fail (EPF). The EPF informs the processor if/when the main power is off thereby requiring the processor to store any important values away immediately. If the processor is signaled by the EPF, the processor can cause the BRM from the incoming data signal to be stored in the non-volatile memory. The newly stored BRM value in the non-volatile memory unit replaces the previous BRM value and is applied by the processor to the VCXO when power to the IRD is connected, the IRD is warm-started or the IRD is reset. Upon the IRD being warm-started or reset, the processor repeats the above process beginning where the BRM is applied to the VCXO to generate the initial clock signal.

In a PVR, the incoming data signal is recorded and stored for later viewing. The present invention operates within a PVR similarly as described above with respect to an IRD. The PVR would have a prestored BRM value in non-volatile memory. The pre-stored BRM value would be applied to the VCXO causing it to oscillate at the desired frequency. If the PVR is moved to another room without a satellite signal or cable signal, then the saved BRM value would be applied to the VCXO thereby allowing the color burst to be on frequency to generate the color sub-carrier for the television set. This would result in the television being able to display the pre-recorded data in full color as initially broadcast.

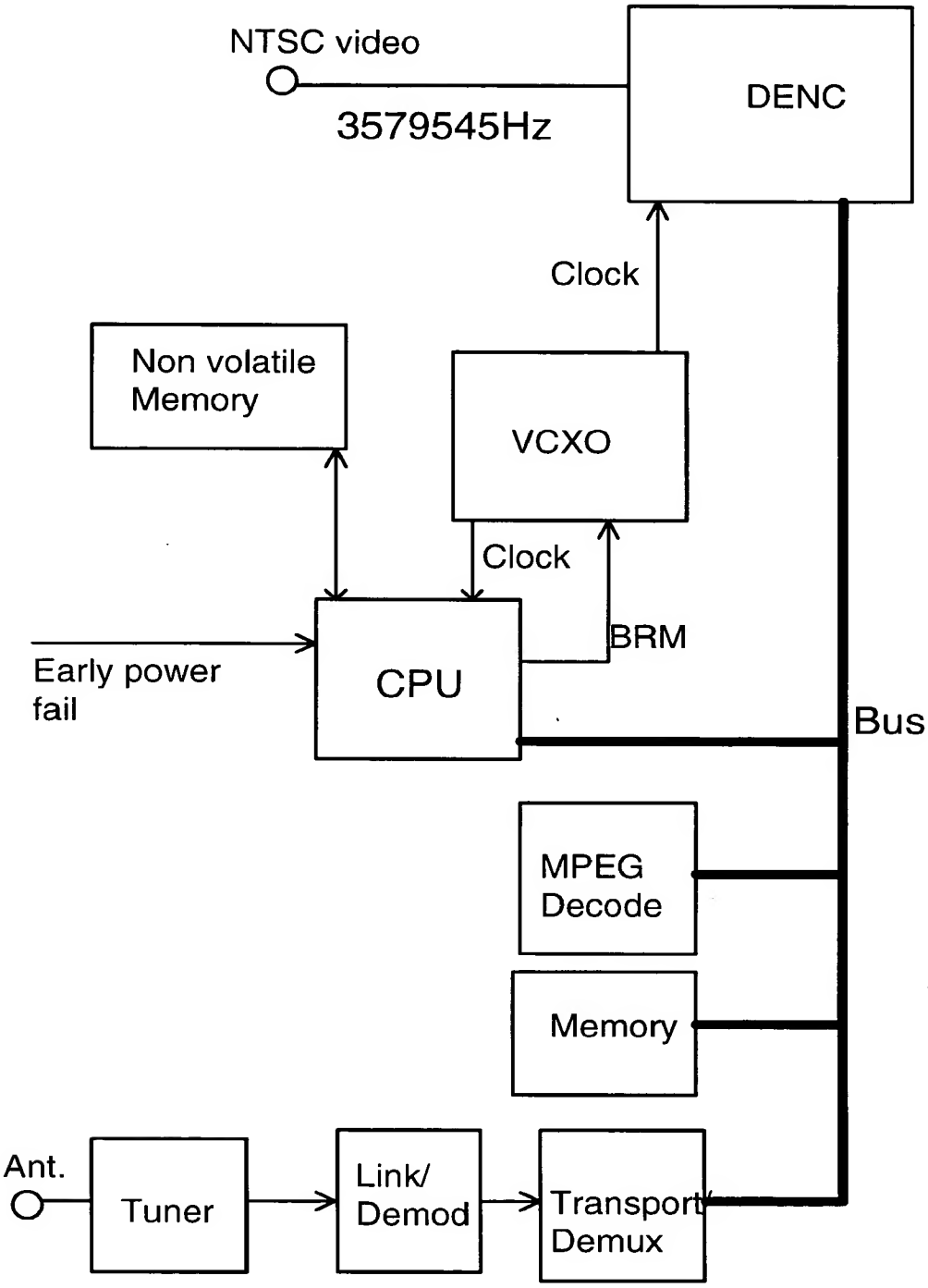
NTSC video
3579545Hz
DENC
Clock
Non volatile Memory
VCXO
Clock
BRM
Early power fail
CPU
Bus
MPEG Decode
Memory
Ant.
Tuner
Link/ Demod
Transport Demux

Fig. 1

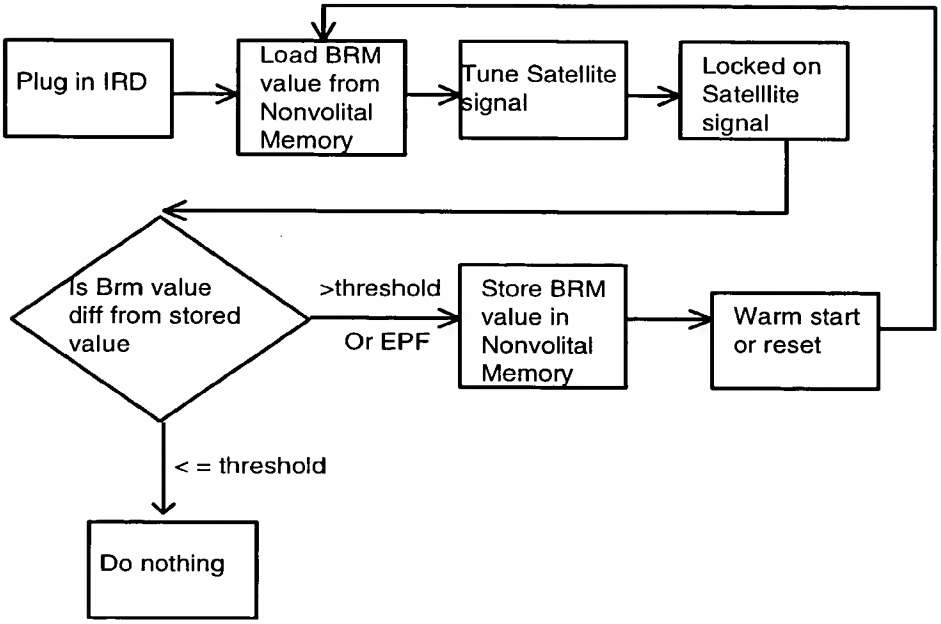
Plug in IRD
Load BRM value from Nonvolital Memory
Tune Satellite signal
Locked on Satelllite signal
Is Brm value diff from stored value
>threshold
Or EPF
Store BRM value in Nonvolital Memory
Warm start or reset
< = threshold
Do nothing

Fig. 2